

Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

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In the Matter of)	
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Auction of 1.4 GHz Bands Licenses)	AU Docket No. 06-
104		
Scheduled for February 7, 2007)	
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Comments of Paul Milgrom and Karen Wrege

We submit these comments in response to the Wireless Telecommunications Bureau's ("Bureau") request for input on auction procedures proposed for licensing 1.4 GHz Bands ("Auction No. 69") on February 7, 2007.¹ Paul Milgrom is the Shirley and Leonard Ely Professor of Humanities and Sciences in the Economics Department at Stanford University and director of the Market Design program at the Stanford Institute for Economic Policy Research (SIEPR). Karen Wrege was Deputy Chief of the Wireless Telecommunications Bureau, Spectrum Management Resources and Technologies Division until January 2006 and is now a consultant to international spectrum authorities and spectrum auction bidders in the US.

Combinatorial Bidding Procedures:

The Bureau has proposed to auction 64 licenses in the 1.4 GHz bands in a simultaneous multiple round (SMR) auction format. The Bureau has considered the possibility of using a simultaneous multiple-round with

¹ Public Notice, *Auction of 1.4 GHz Bands Licenses Scheduled for February 7, 2007*, Report No. AUC-06-09-A, DA 06-1016 (WTB release August 28, 2006) ("Public Notice").

package bidding (“SRM-PB”) format for this auction, and has requested comments on this issue. The FCC reallocated spectrum in the 1390-1395 and 1432-1435 MHz bands to promote the provision of new and technologically innovative services.² The Bureau also decided to allow licensees to avail themselves of both traditional licensing and band manager options. Licensees operating as band managers will be qualified to engage in spectrum leasing activities.³

The 1.4 GHz licenses included in Auction 69 are 52 (2 MHz) unpaired Metropolitan Economic Areas (“MEAs”) licenses and 12 (3 MHz paired) Economic Area Grouping (“EAGs”) licenses. For auctioning the 1.4 GHz bands, we agree with the Bureau that the current SMR-PB rules in which each bidder can have at most a single winning bid may prove to be too complex. However, a simpler combinatorial auction that would allow bidders to place individual bids and/or an all-or-nothing bid on a nationwide collection of licenses in one or more blocks may prove very useful in this context.

It is well established that bidders in the Commission’s standard simultaneous multiple round auction can face an “exposure problem,” according to which the bidder risks acquiring some licenses without acquiring a sufficient package to establish a viable business. This problem has been cited repeatedly in consultants’ reports to the Commission⁴ as well as in the

² Id.

³ Report and Order, Amendments to Parts 1, 2, 27 and 90 of the Commission’s Rules to License Services in the 216-220 MHz, 1390-1395 MHz, 1427-1429 MHz, 1429-1432 MHz, 1432-1435 MHz, 1670-1675 MHz and 2385-2390 MHz Government Transfer Bands, WT Docket No. 02-8, Rel Date: May 24, 2002.

⁴ Three such reports to the FCC include the 1997 report by Charles River Associates and Market Design Inc, “Package Bidding for Spectrum Licenses,” the 2000 report by Cybernomics, “An Experimental Comparison of the Simultaneous Multiple Round Auction and the CRA Combinatorial Auction,” and the 2006 report by Goeree, Holt and Ledyard, “An Experimental Comparison of the FCC’s Combinatorial and Non-Combinatorial Simultaneous Multiple Round Auctions.”

academic literature.⁵ Combinatorial bidding can enhance efficiency and revenues by eliminating that risk and so encouraging competition among bidders with very different business plans, allowing each to bid for the individual licenses or packages that fit best with their plans. While fully flexible package bidding creates burdensome complexity, packages that are designed to meet bidders' most critical needs can sometimes avoid that complexity and promote a simple auction design.⁶

It seems plausible that bidders (either entrepreneur businesses that hope to offer an innovative nationwide service or band managers that intend to lease spectrum to smaller entities) would want to aggregate licenses in these bands across the country. In the 1670-1675 MHz band, the Commission chose a nationwide licensing scheme to provide prospective licensees the flexibility to develop and provide new services ubiquitously across the entire band.⁷ That nationwide license was awarded to OP Corporation (Crown Castle) in Auction No. 46 on October 1, 2003 (Call Sign WPYQ831). OP Corporation, through its affiliate, Crown Castle Mobile Media, plans to use the 1670-1675 MHz license to deploy a wideband Orthogonal Frequency Division Multiplexing ("OFDM")-based, Digital Video Broadcasting-Handhelds ("DVB-H") network to transmit multiple channels of high quality digital video and audio programming to mobile phones and other hand-held devices.⁸

The Report and Order for service rules in the 1.4 GHz bands was adopted in May 2002 and the decision to license the spectrum in large service areas (EAG and MEAs) was based on the Commission's goal to promote the provision of new and technologically innovative services. A simple

⁵ A book of essays discussing this and other issues surrounding combinatorial bidding is: Combinatorial Auctions edited by Peter Cramton, Yoav Shoham, and Richard Steinberg, Cambridge: MIT Press, 2005.

⁶ Rothkopf, Michael, Aleksander Pekec and Ronald Harstad (1998), "Computationally Manageable Combinatorial Auctions," Management Science 44: 1131-1147.

⁷ Id.

⁸ OPP LLC, Licensee of WPYQ831, Request for Waiver, August 2005

combinatorial design could allow both small and large bidders with very different business plans the opportunity to compete effectively for spectrum in these bands.

It seems likely that a limited set of packages to be bid could meet the bidder's main needs in the 1.4 GHz bands without adding excessive complexity to the auction. If the potential bidders include ones that are interested in aggregating a nationwide collection of licenses, the Bureau could create the following six national packages:

Package	Block	Frequencies	Licenses
1	A	1392-1393.5 and 1432-1433.5 MHz	6 EAG licenses
2	B	1393.5-1395 and 1433.5-1435 MHz	6 EAG licenses
3	Unpaired	1390-1392 MHz	52 MEA licenses
4	A and B	1392-1393.5 and 1432-1433.5 MHz 1393.5-1395 and 1433.5-1435 MHz	12 EAG licenses
5	A and Unpaired	1392-1393.5 and 1432-1433.5 MHz 1390-1392 MHz	6 EAG licenses and 52 MEA licenses
6	B and Unpaired	1393.5-1395 and 1433.5-1435 MHz 1390-1392 MHz	6 EAG licenses and 52 MEA licenses

Based on our initial review of the 700 MHz Guard Band and Multiple Spectrum Bands Auction "700 MHz EAG/MEA/County/State Cross Reference" file on the Commission's website, it appears that certain MEA service areas are split among two EAG service areas. Specifically, portions of

MEA002, MEA012, MEA015, MEA020, MEA021, MEA023, MEA028, MEA030, MEA031, MEA032, MEA041, MEA042, and MEA052 are included in two EAG licenses. To allow bidders to aggregate MEA service areas into regional packages, it is important for each MEA to fit into a single EAG license. Provided that the MEAs fit neatly into the EAG licenses, the Bureau could add 6 regional packages that consist of the 52 MEA licenses for a total of 12 packages. Bidders would also be permitted to place bids on individual licenses subject to their current eligibility.

Perhaps the simplest combinatorial auction mechanism with the packages we have described would limit bidders to bid only for individual licenses or for the packages described above. Bidders could have multiple winning bids or provisionally winning bids at each round⁹ and the rules for determining minimum bids for each license and package would be the same as in the current rules used by the FCC's SMR-PB design. The winner determination problem, which is difficult in the general combinatorial auction, would be easy and transparent in the proposed design.

We recommend one further improvement to this package bidding design. Introducing package bidding can create an inefficient bias against bidders who bid for smaller licenses. This problem, which is known as the "threshold problem" and which was discussed in the reports to the FCC cited above, arises from the difficulty faced by bidders seeking to buy individual licenses in coordinating their bids to defeat a package bidder. To mitigate or reverse any bias created by packages, we recommend that the commission adopt a rule that is the mirror-image of its rule governing bidding credits for designated entities: winning package bids would be charged a bidding premium of 25% over the amount of the winning bid. This premium would still allow bidders facing an exposure problem to protect themselves, but it would also mitigate the threshold problem and would discourage large

⁹ In the technical language used at FCC conferences, these would be "OR" bids.

bidders from adopting package bids merely to gain a strategic advantage over smaller bidders.

The Bureau recently implemented the Integrated Spectrum Auction System (ISAS) that was designed to accommodate both SMR and SMR-PB auction designs and the Bureau expended considerable effort to create a system that could flexibly accommodate various design parameters within the same system. The Bureau has consistently developed software that is robust and flexible to accommodate specific auction design requirements based on the specific spectrum to be auctioned. We believe that the simple combinatorial auction proposed in these comments could be incorporated in the ISAS system without excessive effort. The significant changes required are just two: to allow multiple winning bids per bidder and to restrict packages to the set described above.